

# PATENT COOPERATION TREATY

## PCT

### NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

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Crystal Plaza 2  
Washington, DC 20231  
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

<b>Date of mailing (day/month/year)</b> 28 January 1999 (28.01.99)	
<b>International application No.</b> PCT/EP97/03218	<b>Applicant's or agent's file reference</b> BLO DPE970387
<b>International filing date (day/month/year)</b> 19 June 1997 (19.06.97)	<b>Priority date (day/month/year)</b>
<b>Applicant</b> RUBBIA, Carlo	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

22 December 1998 (22.12.98)

☐ in a notice effecting later election filed with the International Bureau on:

\_\_\_\_\_

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	<b>Authorized officer</b> <p style="text-align: center;">C. Carrié</p>
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>BLODPE970387</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/EP 97/ 03218</b>	International filing date (day/month/year) <b>19/06/1997</b>	(Earliest) Priority Date (day/month/year)
Applicant <b>EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).
2. ☐ Unity of invention is lacking (see Box II).
3. ☐ The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing
  - ☐ filed with the international application.
  - ☐ furnished by the applicant separately from the international application,
    - ☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
  - ☐ Transcribed by this Authority
4. With regard to the **title**, ☒ the text is approved as submitted by the applicant
  - ☐ the text has been established by this Authority to read as follows:
5. With regard to the **abstract**,
  - ☒ the text is approved as submitted by the applicant
  - ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.
6. The figure of the **drawings** to be published with the abstract is:
  - Figure No. 7a ☒ as suggested by the applicant. ☐ None of the figures.
  - ☐ because the applicant failed to suggest a figure.
  - ☐ because this figure better characterizes the invention.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/97/03218

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 G21G1/06

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G21G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 160 696 A (BOWMAN CHARLES D) 3 November 1992	1-3, 7-9, 12, 13, 40, 41, 45
Y	see column 2, line 28 - column 3, line 31 see column 3, line 63 - column 5, line 40	4, 6, 14-19, 21, 23-25, 28, 46-48
	see column 7, line 42 - column 14, line 16 see figures 2, 4 --- -/--	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance  
"E" earlier document but published on or after the international filing date  
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  
"O" document referring to an oral disclosure, use, exhibition or other means  
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

6 February 1998

Date of mailing of the international search report

19/02/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Capostagno, E

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 97/03218

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 90 06583 A (TELEKI PETER) 14 June 1990  see page 2, line 13 - line 35 see page 3, line 21 - line 16 see page 7, line 6 - line 27 see page 8, line 13 - line 29 see figure 1  ---	4, 6, 17-19, 21, 23-25, 28
Y	WO 95 12203 A (RUBBIA CARLO) 4 May 1995 cited in the application see abstract see page 10, line 36 - page 11, line 8 see page 39, line 14 - page 40, line 35 see page 45, line 12 - page 46, line 5	14-16, 46-48
A	see page 47, line 1 - line 14 see page 52, line 8 - page 53, line 17  ---	22
A	PATENT ABSTRACTS OF JAPAN vol. 010, no. 048 (P-431), 25 February 1986 & JP 60 192244 A (NIPPON SEIKOSHO KK), 30 September 1985, see abstract  ---	10, 26
A	PATENT ABSTRACTS OF JAPAN vol. 014, no. 405 (P-1100), 31 August 1990 & JP 02 157696 A (NIPPON ATOM IND GROUP CO LTD; OTHERS: 01), 18 June 1990, see abstract  ---	11, 27
A	DATABASE WPI Section Ch, Week 7924 Derwent Publications Ltd., London, GB; Class B04, AN 79-45467B XP002053841 & SU 619 859 A (A MEDICINE RADIOLOG), 30 June 1978 see abstract  ---	29, 30
A	AU 662 966 A (UNION CARBIDE CO.) 7 December 1967 see page 1, paragraph 1 - page 2, paragraph 3  ---	31, 32, 42
A	US 3 998 691 A (SHIKATA EIJI ET AL) 21 December 1976 see column 2, line 42 - line 66 see column 5, line 32 - column 6, line 20  ---	33, 34
A	US 4 017 583 A (MOTOJIMA KENJI ET AL) 12 April 1977 see column 1, line 8 - line 36  ---	35
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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/97/03218

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 95 10114 A (UNIV MCMASTER) 13 April 1995 see page 2, line 1 - line 35 ---	36
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 060 (E-584), 23 February 1988 & JP 62 202528 A (TOSHIBA CORP), 7 September 1987, see abstract ---	37, 38
A	ITOH K M ET AL: "Neutron transmutation doping of isotopically engineered Ge" APPLIED PHYSICS LETTERS, 18 APRIL 1994, USA, vol. 64, no. 16, ISSN 0003-6951, pages 2121-2123, XP002053840 see page 2121, last paragraph - page 2122, paragraph 1 ---	39
A	DATABASE WPI Section Ch, Week 9545 Derwent Publications Ltd., London, GB; Class K07, AN 95-349175 XP002053842 & JP 07 239 397 A (DORYOKURO KAKUNENRYO KAIHATSU), 12 September 1995 see abstract ---	42, 43
A	US 4 721 596 A (MARRIOTT RICHARD ET AL). 26 January 1988 see column 2, line 28 - line 50 see column 11, line 7 - line 16 -----	44

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 97/03218

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5160696 A	03-11-92	NONE	
WO 9006583 A	14-06-90	AU 4528389 A CA 2003671 A EP 0400122 A	26-06-90 28-05-90 05-12-90
WO 9512203 A	04-05-95	AU 7533094 A BR 9407903 A CN 1134197 A EP 0725967 A JP 9506171 T	22-05-95 19-11-96 23-10-96 14-08-96 17-06-97
AU 662966 A	01-09-93	US 5269840 A AU 3610993 A EP 0625174 A JP 7503742 T CA 2125573 A WO 9315152 A	14-12-93 01-09-93 23-11-94 20-04-95 05-08-93 05-08-93
US 3998691 A	21-12-76	NONE	
US 4017583 A	12-04-77	JP 905440 C JP 50108499 A JP 52033280 B	18-04-78 26-08-75 26-08-77
WO 9510114 A	13-04-95	US 5633900 A CA 2172953 A EP 0722611 A	27-05-97 13-04-95 24-07-96
US 4721596 A	26-01-88	AU 539393 B AU 6435380 A EP 0030404 A JP 56125698 A ZA 8007201 A	27-09-84 11-06-81 17-06-81 02-10-81 24-02-82

## Patent Abstracts of Japan

PUBLICATION NUMBER : 60192244  
PUBLICATION DATE : 30-09-85

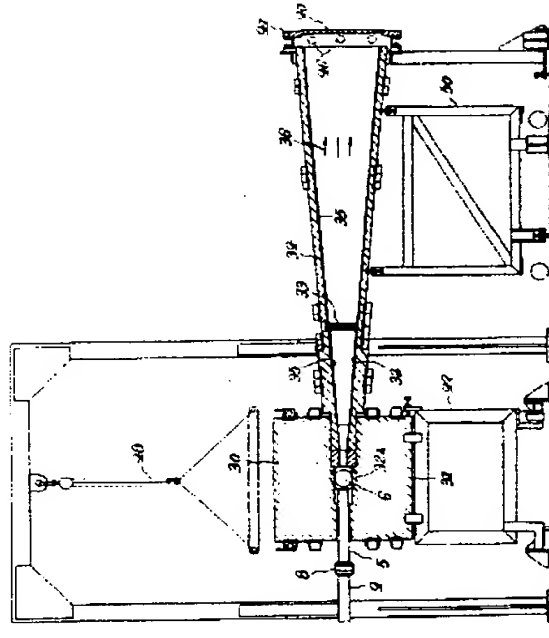
APPLICATION DATE : 12-03-84  
APPLICATION NUMBER : 59047855

APPLICANT : JAPAN STEEL WORKS LTD:THE;

INVENTOR : YOSHIDA HYOGO;

INT.CL. : G01N 23/04 G21G 4/02

TITLE : METHOD AND APPARATUS OF  
NEUTRON RADIOGRAPHY



ABSTRACT : PURPOSE: To make equipment, construction cost, maintenance cost inexpensive, to simplify the operation and to obtain easily a large output neutron ray by using neutrons generated when charged particles beam from a cyclotron collide with beryllium as neutron source.

CONSTITUTION: Charged particle beam of protons released from cyclotron collides with beryllium plate in a target box 6 through beam ducts 4, 5, and a high energy neutron ray is generated. Said ray is made incident on a moderator 30, collides with hydrogen atom of the polyethylene, is scattered elastically, and the velocity is decreased to thermal neutron of low energy. Thermal neutron is made incident respectively on the first and second collimators 32, 32a. In this time, neutron ray uneven in the direction is absorbed to a sheet 35 of cadmium stuck on the inner surface, on the other hand, thermal neutrons from the outer part are absorbed to a cadmium sheet 35. Consequently, uniform and parallel neutron rays 36 are obtained in the collimators 32, 32a.

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## Patent Abstracts of Japan

PUBLICATION NUMBER : 02157696  
PUBLICATION DATE : 18-06-90

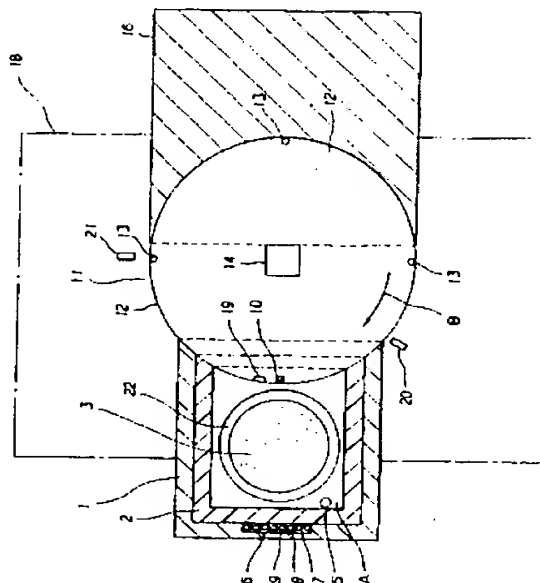
APPLICATION DATE : 09-12-88  
APPLICATION NUMBER : 63310194

APPLICANT : TOSHIBA CORP;

INVENTOR : SANO AKIRA;

INT.CL. : G21C 17/06 G01N 23/222

TITLE : NON-DESTRUCTIVE ANALYSIS  
APPARATUS FOR FISSILE MATERIAL



ABSTRACT : PURPOSE: To assure the stable neutron generation intensity by providing a neutron source consisting of a radioactive isotope element and a neutron source rotational moving device which stagantes the neutron source at a time interval in a measuring chamber.

CONSTITUTION: The half of a rotary disk 12 is inserted into a groove 17 formed to a neutron source container 16. The other half of the rotary disk 12 is inserted into the groove 17 formed to the neutron source container 16. The neutron source container 16 consists of the block of, for example, polyethylene and the other half of the rotary disk 12 is inserted into the groove 17 formed to the neutron source container 16. The neutron source container 16 consists of the block of, for example, polyethylene; namely, the container is so formed that the half of the rotary disk 12 can be inserted therein. The neutron source 10 can be stagnated for 5 seconds in, for example, the measuring chamber A at the time of stagnating the neutron ray 10 stepwise in the measuring chamber A. The stable neutron intensity is obtd. in this way.

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XP-002053841

1/1 - (C) WPI / DERWENT  
AN - 79-45467B ç24!  
PR - SU76 429566 761206  
TI - Differential diagnosis of thyroid gland cancer - by  
iodine concn. determ. in new tissue using neutron  
activation analysis and comparison with normal level  
IW - DIFFERENTIAL DIAGNOSE THYROID GLAND CANCER IODINE  
CONCENTRATE DETERMINE NEW TISSUE NEUTRON ACTIVATE  
ANALYSE COMPARE NORMAL LEVEL  
IN - VTYURIN B M; ZAICHIK V E; ZHERBIN E A  
PA - (AMRA-R) A MEDICINE RADIOLOG  
PN - SU619859 A 780630 DW7924 000pp  
ORD - 1978-06-30  
IC - G01N33/16  
FS - CPI;EPI  
DC - B04 J04 S03 S05  
AB - SU-619859 Differential diagnosis of thyroid gland  
cancer by simpler, more accurate and less injurious  
method is based on comparing I2 concn. in new tissue  
with normal levels. I2 concn. is determined by neutron  
activation anaylsis.  
- In an example, 8.7 mg thyroid gland sample: are  
irradiated in cooled Cd channel with radiation density  
1013 neutrons cm<sup>-2</sup> sec<sup>-1</sup> to convert I127 into I128  
radioactive isotope (half life 25 mins). Analysis then  
sows I2 concn.  
- Normal concn. is 35 micro/g/g. Results show that  
diagnosis is correct in over 80% of cases. Readings  
below 30 are 95% reliable. Readings between 31 and 60  
are 80% reliable.

# PCT

28 Rec'd PCT/RO 15 DEC 1999

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum) BLO DPE970387

**Box No. I TITLE OF INVENTION**  
NEUTRON-DRIVEN ELEMENT TRANSMUTER

**Box No. II APPLICANT**

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH  
CH 1211 GENEVE 23  
SWITZERLAND

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (i.e. country) of nationality:

State (i.e. country) of residence: SWITZERLAND

This person is applicant for the purposes of:

☐ all designated States

☒ all designated States except the United States of America

☐ the United States of America only

☐ the States indicated in the Supplemental Box

**Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)**

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

RUBBIA Carlo  
9 Chemin des Tulipiers  
CH 1200 GENEVE  
SWITZERLAND

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (if this check-box is marked, do not fill in below.)

State (i.e. country) of nationality: ITALIAN

State (i.e. country) of residence: SWITZERLAND

This person is applicant for the purposes of:

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

**Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

LOISEL Bertrand,  
CABINET PLASSERAUD  
84 Rue d'Amsterdam  
75440 PARIS CEDEX 09  
FRANCE

Telephone No.

01 44 63 41 11

Facsimile No.

01 42 80 01 59

Teleprinter No.

☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent

**Box No.V DESIGNATION OF STATES**

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

**Regional Patent**

- ☒ **AP ARIPO Patent:** KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

**National Patent (if other kind of protection or treatment desired, specify on dotted line):**

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> AL Albania                               | <input checked="" type="checkbox"/> LU Luxembourg                                |
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| <input checked="" type="checkbox"/> AZ Azerbaijan                            | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina                | <input checked="" type="checkbox"/> MN Mongolia                                  |
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| <input checked="" type="checkbox"/> BG Bulgaria                              | <input checked="" type="checkbox"/> MX Mexico                                    |
| <input checked="" type="checkbox"/> BR Brazil                                | <input checked="" type="checkbox"/> NO Norway                                    |
| <input checked="" type="checkbox"/> BY Belarus                               | <input checked="" type="checkbox"/> NZ New Zealand                               |
| <input checked="" type="checkbox"/> CA Canada                                | <input checked="" type="checkbox"/> PL Poland                                    |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein  | <input checked="" type="checkbox"/> PT Portugal                                  |
| <input checked="" type="checkbox"/> CN China                                 | <input checked="" type="checkbox"/> RO Romania                                   |
| <input checked="" type="checkbox"/> CU Cuba                                  | <input checked="" type="checkbox"/> RU Russian Federation                        |
| <input checked="" type="checkbox"/> CZ Czech Republic                        | <input checked="" type="checkbox"/> SD Sudan                                     |
| <input checked="" type="checkbox"/> DE Germany                               | <input checked="" type="checkbox"/> SE Sweden                                    |
| <input checked="" type="checkbox"/> DK Denmark                               | <input checked="" type="checkbox"/> SG Singapore                                 |
| <input checked="" type="checkbox"/> EE Estonia                               | <input checked="" type="checkbox"/> SI Slovenia                                  |
| <input checked="" type="checkbox"/> ES Spain                                 | <input checked="" type="checkbox"/> SK Slovakia                                  |
| <input checked="" type="checkbox"/> FI Finland                               | <input checked="" type="checkbox"/> TJ Tajikistan                                |
| <input checked="" type="checkbox"/> GB United Kingdom                        | <input checked="" type="checkbox"/> TM Turkmenistan                              |
| <input checked="" type="checkbox"/> GE Georgia                               | <input checked="" type="checkbox"/> TR Turkey                                    |
| <input checked="" type="checkbox"/> HU Hungary                               | <input checked="" type="checkbox"/> TT Trinidad and Tobago                       |
| <input checked="" type="checkbox"/> IL Israel                                | <input checked="" type="checkbox"/> UA Ukraine                                   |
| <input checked="" type="checkbox"/> IS Iceland                               | <input checked="" type="checkbox"/> UG Uganda                                    |
| <input checked="" type="checkbox"/> JP Japan                                 | <input checked="" type="checkbox"/> US United States of America                  |
| <input checked="" type="checkbox"/> KE Kenya                                 | <input checked="" type="checkbox"/> UZ Uzbekistan                                |
| <input checked="" type="checkbox"/> KG Kyrgyzstan                            | <input checked="" type="checkbox"/> VN Viet Nam                                  |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea |  |
| <input checked="" type="checkbox"/> KR Republic of Korea                     |  |
| <input checked="" type="checkbox"/> KZ Kazakstan                             |  |
| <input checked="" type="checkbox"/> LC Saint Lucia                           |  |
| <input checked="" type="checkbox"/> LK Sri Lanka                             |  |
| <input checked="" type="checkbox"/> LR Liberia                               |  |
| <input checked="" type="checkbox"/> LS Lesotho                               |  |
| <input checked="" type="checkbox"/> LT Lithuania                             |  |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

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- ☒ YU Yugoslavia
- ☒ ZW ZIMBABWE
- ☒ SL SIERRA LEONE

In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of \_\_\_\_\_

The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

**Box No. VI PRIORITY CLAIM**Further priority claims are indicated in the Supplemental Box ☐

The priority of the following earlier application(s) is hereby claimed:

Country (in which, or for which, the application was filed)	Filing Date (day/month/year)	Application No.	Office of filing (only for regional or international application)
item (1)			
item (2)			
item (3)			

Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):

☐ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):
**Box No. VII INTERNATIONAL SEARCHING AUTHORITY**

Choice of International Searching Authority (ISA) (If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA /

Earlier search Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request:

Country (or regional Office):

Date (day/month/year):

Number:

**Box No. VIII CHECK LIST**

This international application contains the following number of sheets:

1. request : 3 sheets  
 2. description : 92 sheets  
 3. claims : 7 sheets  
 4. abstract : 1 sheets  
 5. drawings : 21 sheets

Total : 124 sheets

This international application is accompanied by the item(s) marked below:

1. ☐ separate signed power of attorney  
 2. ☐ copy of general power of attorney  
 3. ☐ statement explaining lack of signature  
 4. ☐ priority document(s) identified in Box No. VI as item(s):  
 5. ☒ fee calculation sheet  
 6. ☐ separate indications concerning deposited microorganisms  
 7. ☐ nucleotide and/or amino acid sequence listing (diskette)  
 8. ☐ other (specify):

Figure No. 7a of the drawings (if any) should accompany the abstract when it is published.**Box No. IX SIGNATURE OF APPLICANT OR AGENT**

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

LOISEL Bertrand

EUROPEAN PATENT ATTORNEY

For receiving Office use only

1. Date of actual receipt of the purported international application:	2. Drawings:  <input type="checkbox"/> received:  <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority specified by the applicant: ISA /	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

# PCT

## FEE CALCULATION SHEET

### Annex to the Request

For receiving Office use only

International application No.

Date stamp of the receiving Office

Applicant's or agent's  
file reference

BLO DPE970387

Applicant

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

#### CALCULATION OF PRESCRIBED FEES

##### 1. TRANSMITTAL FEE

200 DEM

T

##### 2. SEARCH FEE

S

International search to be carried out by

(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

##### 3. INTERNATIONAL FEE

###### Basic Fee

The international application contains 124 sheets.

first 30 sheets

955 DEM

b<sub>1</sub>

94

x 19 DEM

=

1 786 DEM

b<sub>2</sub>

remaining sheets

additional amount

Add amounts entered at b<sub>1</sub> and b<sub>2</sub> and enter total at B

2 741 DEM

B

###### Designation Fees

The international application contains 72 designations.

11

x

232 DEM

=

2 552 DEM

D

number of designation fees

amount of designation fee

payable (maximum 11)

Add amounts entered at B and D and enter total at I

5 293 DEM

I

Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.

##### 4. FEE FOR PRIORITY DOCUMENT

P

##### 5. TOTAL FEES PAYABLE

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

5 493 DEM

TOTAL

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#### MODE OF PAYMENT

☒ authorization to charge  
deposit account (see below)

☐ bank draft

☐ coupons

☐ cheque

☐ cash

☐ other (specify):

☐ postal money order

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The RO/ ☒ is hereby authorized to charge the total fees indicated above to my deposit account.

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28040012 CABINET PLASSERAUD Paris, June 17, 1997

LOISEL Bertrand

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Date (day/month/year)

Signature

## PATENT COOPERATION TREATY



## PCT

REC'D 13 JUL 1999

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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>BLODPE970387</b>		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/EP97/03218</b>	International filing date (day/month/year) <b>19/06/1997</b>	Priority date (day/month/year) <b>19/06/1997</b> JONE	
International Patent Classification (IPC) or national classification and IPC <b>G21G1/06</b>			
Applicant <b>EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH et al.</b>			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of two sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"><li>I <input checked="" type="checkbox"/> Basis of the report</li><li>II <input type="checkbox"/> Priority</li><li>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li><li>IV <input type="checkbox"/> Lack of unity of invention</li><li>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li><li>VI <input type="checkbox"/> Certain documents cited</li><li>VII <input type="checkbox"/> Certain defects in the international application</li><li>VIII <input type="checkbox"/> Certain observations on the international application</li></ul>			
Date of submission of the demand <b>22/12/1998</b>		Date of completion of this report <b>09.07.99</b>	
Name and mailing address of the international preliminary examining authority:  <b>European Patent Office D-80298 Munich Tel. (+49-89) 2399-0 Tx: 523656 epmu d Fax: (+49-89) 2399-4465</b>		Authorized officer <b>Maugain, C</b> Telephone No. (+49-89) 2399 2199 	

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP97/03218

## I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

### Description, pages:

1-63,65-91 as originally filed

64,92 as received on 31/05/1999 with letter of 26/05/1999

### Claims, No.:

1-48 as originally filed

### Drawings, sheets:

1/21-21/21 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP97/03218

---

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-16,17-39,40-48
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-16,17-39,40-48
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-48
	No:	Claims	

**2. Citations and explanations**

**see separate sheet**



**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1:US.A. 5 160 696

D2:WO.A. 95 12203 cited in the application

D3:WO.A. 90 06583

2. The document D1 is regarded as being the closest prior art to the subject-matter of the independent method claims 1, 17, 40, and describes (cf. the fig. 2-4; the abstract; the description, from col. 2, l. 28 to col. 3, l. 31 and from l. 63 to col. 5, l. 40; from col. 7, l. 42 to col. 11, l. 22 and from col. 12, l. 10 to col. 14, l. 16; the claims 1-8, 16-23, 31-38, 46, 47, 49-54) apparatuses (40) from whose is to be deduced a method of exposing a material (fertile or/and fissile nuclear materials, nuclear wastes 98) to a neutron flux wherein the material is disposed around a neutron source (42, 44; liquid-metal/ such as a lead-bismuth eutectic mixture/ spallation target) disposed in/ surrounded by a neutron diffusing medium ( liquid metal /Pb-Bi) substantially transparent to neutrons and having further the features of claim 1, lines 6-9, under other independent claims of the application.

The subject matter of claim 1 is distinguished from such a method in that the material is distributed in the neutron diffusing medium (cf. the description, the paragraph 1.1, from p. 1 to p. 4, l. 14).

Thus, the subject matter of claim 1 and of the other independent claims 17, 40 is new under Art. 33.2 PCT.

2. Moreover, none of the available documents discloses, and neither considered individually or into a combination of their teaching suggest/s a method of transmutation as claimed in the independent claims 1, 17 and 40.

In fact, document D2 discloses (cf. the abstract; the description, p. 3, l. 9-29; from p. 6, l. 34 to p. 7, l. 21; from p. 10, l. 36 to p. 11, l. 8; from p. 39, l. 14 to p. 40, l. 35; from p. 45, l. 12 to p. 47, l. 14; from p. 52, l. 8 to p. 53, l. 17 and the claims 1, 22-28 and 36) an energy amplifier core, which may be seen as a neutron source surrounded by a transparent

neutron diffusing medium, but that one does not contain a material to be exposed in distributed form; and

document D3 refers to (cf. the abstract; the description p.1, l.8-17; p.2, l.22-35; p.3, l.21-33; p.7, l.6-27) a method of utilizing the neutron flux of a nuclear reactor for producing non radioactive materials, the method comprising the step of arranging a target 2 such as a plate of a moderator, such as beryllium, for slowing down the quick and other non- thermal reactor neutrons. The target 2 consists of a front layer 3 forming a moderating body of beryllium  ${}^4\text{Be}$ , a metal plate 4 to be transformed/transmuted and a rear reflecting layer 5 of a material, such as beryllium, to ensure reflection of the neutrons back to the target.

The other available documents disclose features, per se, of the dependent claims, but they do not suggest the essential feature of the independent claims 1, 17 and 40 e.g. the material to be transmuted is distributed in a neutron diffusing medium.

Therefore, the subject matter of the independent claims 1, 17, 40 and of their dependent claims 2-16, 18-39, 41-48 respectively, involves an inventive step in the sense of Art.33.3 PCT.

several different targets can be inserted in the device.

Since the fraction of the neutrons used for the activation is extremely small, many samples can be  
5 simultaneously irradiated in the Activator.

### 5.3. - Production of $^{99m}\text{Tc}$ from a Molybdenum matrix.

The target is made either of isotopically enriched  $^{98}\text{Mo}$  or, if this is not available, of Natural Molybdenum containing 24.13% of  $^{98}\text{Mo}$ , in a chemical form discussed  
10 later on. The short-lived  $^{99}\text{Mo}$  ( $t_{1/2}=65.94$  h) is activated, in turn decaying into  $^{99m}\text{Tc}$ . The Mo must be very pure. In particular, it must not contain Rhenium, which complicates the extraction of Molybdenum, since Rhenium has chemical properties similar to those of  
15 Technetium. In general, the presence of impurities may lead to unwanted radio-nuclides. The yield of  $^{99}\text{Mo}$  according to Table 3 and for a constant irradiation of 1 gram of  $^{98}\text{Mo}$  (4 g of Natural Mo) for a time  $t$  is  $1.66 \times 10^{-6} \times [1 - \exp(-t/95.35 \text{ h})] \times S_0$  GBq, where  $S_0$  is the  
20 neutron yield of the source. For a continuous exposure of 100 hours,  $1.07 \times 10^{-6} \times S_0$  GBq/gr of  $^{99}\text{Mo}$  are activated.

The extraction of Technetium (1 GBq of  $^{99m}\text{Tc}$  corresponds to 5.13 ng of metal) out of Molybdenum matrix is a relatively simple process, vastly documented in the  
25 literature (see, for instance, A.K. Lavrukhina and A.A. Pozdnyakov, "Analytical Chemistry of Technetium, Promethium, Astatine and Francium", Academy of Sciences of the USSR, Israel Program for Scientific Translations, Jerusalem 1969 ; and also R.D. Peacock, "The chemistry of  
30 Technetium and Rhenium" Elsevier Publishing Company, 1966).

Though it is not part of the activation procedure, for completeness we briefly mention the separation on sorbents, especially Aluminium Oxide ( $\text{Al}_2\text{O}_3$ ) which is  
35 widely used. An efficient process of extracting micro-

Target	Isotope	Natur. Conc.	Reson. Integr.	Therm. X-sect	Activate d Isotope	half-life activated	Decay mode	Decay Br. R.	Next Isotope	half-life next Isot.
Os	Os-190	0.264	24.20	15.0	Os-191	15.40 d	$\beta^-$	100.0		
Os	Os-190	0.264	24.20	15.0	Os-191*	13.10 h	$\gamma$	100.0	Os-191	15.40 d
Os	Os-192	0.41	6.12	2.29	Os-193	1.271 d	$\beta^-$	100.0		
Ir	Ir-191	0.373	1170.	1100.	Ir-192	73.83 d	$\beta^-$	95.24		
Ir	Ir-191	0.373	1170.	1100.	Ir-192	73.83 d	$\beta^+$	4.76		
Ir	Ir-191	0.373	1170.	1100.	Ir-192*	1.450 m	$\gamma$	99.98	Ir-192	73.83 d
Ir	Ir-191	0.373	1170.	1100.	Ir-192*	1.450 m	$\beta^-$	0.02		
Ir	Ir-193	0.627	1310.	128.0	Ir-194	19.15 h	$\beta^-$	100.0		
Ir	Ir-193	0.627	1310.	128.0	Ir-194*	171.0 d	$\beta^-$	100.0		
Pt	Pt-190	0.0001	86.70	175.0	Pt-191	2.900 d	$\beta^+$	100.0		
Pt	Pt-192	0.0079	162.0	12.90	Pt-193*	4.330 d	$\gamma$	100.0		
Pt	Pt-194	0.329	8.15	1.65	Pt-195*	4.020 d	$\gamma$	100.0		
Pt	Pt-196	0.253	5.95	0.813	Pt-197	18.30 h	$\beta^-$	100.0		
Pt	Pt-196	0.253	5.95	0.813	Pt-197*	1.590 h	$\beta^-$	3.3		
Pt	Pt-196	0.253	5.95	0.813	Pt-197*	1.590 h	$\gamma$	96.7	Pt-197	18.30 h
Pt	Pt-198	0.072	52.70	4.34	Pt-199	30.80 m	$\beta^-$	100.0	Au-199	3.139 d
Au	Au-197	1.00	1550.	113.0	Au-198	2.693 d	$\beta^-$	100.0		
Au	Au-197	1.00	1550.	113.0	Au-198*	2.300 d	$\gamma$	100.0	Au-198	2.693 d
Hg	Hg-196	0.0014	230.	3520.	Hg-197	2.672 d	$\beta^+$	100.0		
Hg	Hg-196	0.0014	230.	3520.	Hg-197*	23.80 h	$\gamma$	93.0	Hg-197	2.672 d
Hg	Hg-196	0.0014	230.	3520.	Hg-197*	23.80 h	$\beta^+$	7.0		
Hg	Hg-198	0.1002	74.80	2.28	Hg-199*	42.60 m	$\gamma$	100.0		
Hg	Hg-202	0.298	2.65	5.68	Hg-203	46.61 d	$\beta^-$	100.0		
Hg	Hg-204	0.0685	0.256	0.492	Hg-205	5.200 m	$\beta^-$	100.0		
Tl	Tl-205	0.7048	0.648	0.119	Tl-206	4.199 m	$\beta^-$	100.0		
Tl	Tl-205	0.7048	0.648	0.119	Tl-206*	3.740 m	$\gamma$	100.0	Tl-206	4.199 m
Pb	Pb-208	0.524	0.61	0.06	Pb-209	3.253 h	$\beta^-$	100.0		
Bi	Bi-209	1.00	0.202	0.0389	Bi-210	5.013 d	$\alpha$	0.0	Tl-206	4.199 m
Bi	Bi-209	1.00	0.202	0.0389	Bi-210	5.013 d	$\beta^-$	100.0	Po-210	138.4 d
Th	Th-232	1.00	83.50	8.49	Th-233	22.30 m	$\beta^-$	100.0	Pa-233	26.97 d

## PATENT COOPERATION TREATY

Transmitter -

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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CABINET PLASSERAUD  
84, rue d'Amsterdam  
F-75440 PARIS Cedex 09  
FRANCE

RECU LE

12. JUL. 1999

Cbt Plasseraud

PCT

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)

28 Rec'd PCT/PIC 15 DEC 1999

Date of mailing  
(day/month/year)

09.07.99

Applicant's or agent's file reference  
BLODPE970387

## IMPORTANT NOTIFICATION

International application No.  
PCT/EP97/03218International filing date (day/month/year)  
19/06/1997Priority date (day/month/year)  
19/06/1997

Applicant

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

## 4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

European Patent Office  
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# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT



(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>BLODPE970387</b>		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/EP97/03218</b>	International filing date (day/month/year) <b>19/06/1997</b>	Priority date (day/month/year) <b>19/06/1997</b>	
International Patent Classification (IPC) or national classification and IPC <b>G21G1/06</b>			
Applicant <b>EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH et al.</b>			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of two sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand  <b>22/12/1998</b>	Date of completion of this report  <b>09.07.99</b>
Name and mailing address of the international preliminary examining authority:   <b>European Patent Office</b> <b>D-80298 Munich</b> <b>Tel. (+49-89) 2399-0 Tx: 523656 epmu d</b> <b>Fax: (+49-89) 2399-4465</b>	Authorized officer  <b>Maugain, C</b>  Telephone No. (+49-89) 2399 2199  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP97/03218

**I. Basis of the report**

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

**Description, pages:**

1-63,65-91	as originally filed		
64,92	as received on	31/05/1999 with letter of	26/05/1999

**Claims, No.:**

1-48 as originally filed

**Drawings, sheets:**

1/21-21/21 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP97/03218

---

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	1-16,17-39,40-48
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-16,17-39,40-48
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-48
	No:	Claims	

**2. Citations and explanations**

**see separate sheet**



**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following documents:

D1:US.A. 5 160 696

D2:WO.A. 95 12203 cited in the application

D3:WO.A. 90 06583

2. The document D1 is regarded as being the closest prior art to the subject-matter of the independent method claims 1, 17, 40, and describes (cf. the fig. 2-4; the abstract; the description, from col. 2, l. 28 to col. 3, l. 31 and from l. 63 to col. 5, l. 40; from col. 7, l. 42 to col. 11, l. 22 and from col. 12, l. 10 to col. 14, l. 16; the claims 1-8, 16-23, 31-38, 46, 47, 49-54) apparatuses (40) from whose is to be deduced a method of exposing a material (fertile or/and fissile nuclear materials, nuclear wastes 98) to a neutron flux wherein the material is disposed around a neutron source (42, 44; liquid-metal/ such as a lead-bismuth eutectic mixture/ spallation target) disposed in/ surrounded by a neutron diffusing medium ( liquid metal /Pb-Bi) substantially transparent to neutrons and having further the features of claim 1, lines 6-9, under other independent claims of the application.

The subject matter of claim 1 is distinguished from such a method in that the material is distributed in the neutron diffusing medium (cf. the description, the paragraph 1.1, from p. 1 to p. 4, l. 14).

Thus, the subject matter of claim 1 and of the other independent claims 17, 40 is new under Art. 33.2 PCT.

2. Moreover, none of the available documents discloses, and neither considered individually or into a combination of their teaching suggest/s a method of transmutation as claimed in the independent claims 1, 17 and 40.

In fact, document D2 discloses (cf. the abstract; the description, p. 3, l. 9-29; from p. 6, l. 34 to p. 7, l. 21; from p. 10, l. 36 to p. 11, l. 8; from p. 39, l. 14 to p. 40, l. 35; from p. 45, l. 12 to p. 47, l. 14; from p. 52, l. 8 to p. 53, l. 17 and the claims 1, 22-28 and 36) an energy amplifier core, which may be seen as a neutron source surrounded by a transparent

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/EP97/03218

neutron diffusing medium, but that one does not contain a material to be exposed in distributed form; and

document D3 refers to (cf. the abstract; the description p.1, l.8-17; p.2, l.22-35; p.3, l.21-33; p.7, l.6-27) a method of utilizing the neutron flux of a nuclear reactor for producing non radioactive materials, the method comprising the step of arranging a target 2 such as a plate of a moderator, such as beryllium, for slowing down the quick and other non- thermal reactor neutrons. The target 2 consists of a front layer 3 forming a moderating body of beryllium  ${}^4\text{Be}$ , a metal plate 4 to be transformed/transmuted and a rear reflecting layer 5 of a material, such as beryllium, to ensure reflection of the neutrons back to the target.

The other available documents disclose features, per se, of the dependent claims, but they do not suggest the essential feature of the independent claims 1, 17 and 40 e.g. the material to be transmuted is distributed in a neutron diffusing medium.

Therefore, the subject matter of the independent claims 1, 17, 40 and of their dependent claims 2-16, 18-39, 41-48 respectively, involves an inventive step in the sense of Art.33.3 PCT.